

# Appendix 5A: Characteristics of National Samples

## France

A single school sample was used for both advanced mathematics and physics.

### Coverage and Exclusions

- Coverage of the national desired target population was 100 percent
- School-level exclusions consisted of overseas territories and private schools without contract
- Within-school exclusions consisted of students with intellectual disabilities and students with functional disabilities

### Sample Design

- Explicit stratification by school type (Lycée general et technologique—upper secondary schools with general and technologic streams, Lycée polyvalent—the remaining upper secondary schools) and success rate in the scientific baccalaureate during the 2012 session (3 or 5 success rate levels depending on the school type)
- No implicit stratification
- Schools sampled using probability proportional to (school) size systematic sampling
- Two classes in the selected schools were sampled whenever possible
- Half of the students in the selected classes were randomly assigned an advanced mathematics booklet, and the other half were assigned a physics booklet

### Field Test Sample

- 32 schools were sampled for the field test at the same time as the data collection sample, thus no schools were selected for both activities

**Allocation of Advanced Mathematics and Physics School Sample in France**

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Upper secondary schools with general and technologic streams, with success rate level I	22	0	22	0	0	0	0
Upper secondary schools with general and technologic streams, with success rate level II	22	0	22	0	0	0	0
Upper secondary schools with general and technologic streams, with success rate level III	22	0	22	0	0	0	0
Upper secondary schools with general and technologic streams, with success rate level IV	22	0	22	0	0	0	0
Upper secondary schools with general and technologic streams, with success rate level V	22	0	21	0	0	1	0
Other upper secondary schools, with success rate level I	12	1	11	0	0	0	0
Other upper secondary schools, with success rate level II	12	0	12	0	0	0	0
Other upper secondary schools, with success rate level III	12	0	12	0	0	0	0
<b>Total</b>	<b>146</b>	<b>1</b>	<b>144</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>

## Italy

The sample design for Italy consisted of a mix of the two main designs. Some schools were sampled for advanced mathematics only, some were sampled for physics only, and some were sampled for both subjects.

### Coverage and Exclusions

- Coverage of the national desired target population was 100 percent
- School-level exclusions consisted of very small schools (less than 5 eligible students), Slovenian language schools, and German language schools
- Within-school exclusions consisted of students with functional disabilities

### Sample Design

- Explicit stratification by school type (technical institute, scientific lyceum) and region (center, southern peninsulas and islands, northeast, northwest, south)
- No implicit stratification
- Courses of interest were found in two types of schools: technical institutes with advanced mathematics classes only and scientific lyceum in which both subjects are compulsory
- A total of 32 schools were sampled from the technical-institute strata for the advanced mathematics sample. From the scientific-lyceum strata, a total of 120 schools were first sampled, from which a subsample of 88 schools was randomly selected for advanced mathematics and physics. The other 32 schools were sampled only for the physics assessment.
- In schools with advanced mathematics classes only, one class was sampled per school, and two classes were sampled in larger schools of 80 or more students
- In schools selected only for the physics target population, one class was sampled per school, and two classes were sampled in larger schools (80 or more students)
- In schools selected for both advanced mathematics and physics target populations, three classes were sampled whenever possible and advanced mathematics and physics booklets were rotated within sampled classes

### Field Test Sample

- 34 schools were sampled for the field test. The data collection sample was selected after the field test sample, without controlling for overlap.

### Allocation of Advanced Mathematics School Sample in Italy

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Technical institute with advanced mathematics program only - Center	6	0	4	2	0	0	0
Technical institute with advanced mathematics program only - Southern Peninsulas and Islands	6	0	5	0	0	1	0
Technical institute with advanced mathematics program only - Northeast	6	0	5	1	0	0	0
Technical institute with advanced mathematics program only - Northwest	8	0	8	0	0	0	0
Technical institute with advanced mathematics program only - South	6	0	6	0	0	0	0
Scientific lyceum with advanced mathematics and physics program - Center	18	0	17	1	0	0	0
Scientific lyceum with advanced mathematics and physics program - Southern Peninsulas and Islands	16	0	13	2	0	1	0
Scientific lyceum with advanced mathematics and physics program - Northeast	14	0	14	0	0	0	0
Scientific lyceum with advanced mathematics and physics program - Northwest	18	0	15	0	1	2	0
Scientific lyceum with advanced mathematics and physics program - South	22	0	17	1	1	3	0
<b>Total</b>	<b>120</b>	<b>0</b>	<b>104</b>	<b>7</b>	<b>2</b>	<b>7</b>	<b>0</b>

**Allocation of Physics School Sample in Italy**

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Scientific lyceum with advanced mathematics and physics program - Center	22	0	21	1	0	0	0
Scientific lyceum with advanced mathematics and physics program - Southern Peninsulas and Islands	20	0	17	2	0	1	0
Scientific lyceum with advanced mathematics and physics program - Northeast	20	0	20	0	0	0	0
Scientific lyceum with advanced mathematics and physics program - Northwest	26	0	23	0	1	2	0
Scientific lyceum with advanced mathematics and physics program - South	32	0	25	2	2	3	0
<b>Total</b>	<b>120</b>	<b>0</b>	<b>106</b>	<b>5</b>	<b>3</b>	<b>6</b>	<b>0</b>

## Lebanon

A single school sample was selected for both advanced mathematics and physics.

### Coverage and Exclusions

- Coverage of the national desired target population was 100 percent
- School-level exclusions consisted of very small schools (less than 8 eligible students)
- No within-school exclusions

### Sample Design

- Explicit stratification by school type (private, public)
- Implicit stratification by region (7)
- All schools with eligible students were selected for the data collection
- All eligible classes in a school were expected to be sampled. However, a problem during data collection resulted in only one class being sampled per school, leading to a reduced sample size for both target populations.
- Half of the students in the selected classes were randomly assigned an advanced mathematics booklet, and the remaining half were assigned a physics booklet
- In the public school stratum, classes were used as variance estimation strata and half classes were used to build jackknife replicates

### Field Test Sample

- A sample of 48 schools was selected for the field test and used for both populations. All schools selected for the field test were also included in the data collection sample.

### Allocation of Advanced Mathematics and Physics School Sample in Lebanon

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Private	211	1	121	0	0	89	0
Public	144	0	130	0	0	14	0
<b>Total</b>	<b>355</b>	<b>1</b>	<b>251</b>	<b>0</b>	<b>0</b>	<b>103</b>	<b>0</b>

## Norway

All eligible schools in Norway were selected for TIMSS Advanced 2015, but each school was selected for only one population, resulting in two separate school samples for advanced mathematics and physics.

### Coverage and Exclusions

- Coverage of the national desired target population was 100 percent
- School-level exclusions consisted of very small schools (less than 6 eligible students)
- Within-school exclusions consisted of students with intellectual disabilities

### Sample Design

- Explicit stratification by classes taught for each subject (advanced mathematics classes only, both advanced mathematics and physics classes) and the number of eligible physics students (between 6 and 9, between 10 and 19, between 20 and 34, 35 or more). Schools with less than 6 physics students were sampled for advanced mathematics only.
- No implicit stratification
- All schools from the advanced mathematics explicit stratum were selected
- From the remaining advanced mathematics and physics strata, all schools were randomly sampled either for advanced mathematics or for physics through a disproportional allocation procedure. This procedure ensured that sample size requirements for each study population were reached by sampling a higher proportion of schools for physics from the strata of schools with larger numbers of physics students and sampling a higher proportion of schools for advanced mathematics in the strata of schools with less physics students.
- In schools selected for advanced mathematics, all eligible advanced mathematics classes were sampled
- In schools selected for physics, all eligible physics classes were sampled
- In the advanced mathematics school stratum, classes were used as variance estimation strata and half classes were used to build jackknife replicates

### Field Test Sample

- A convenience sample of 21 international baccalaureate schools was selected for the field test

### Allocation of Advanced Mathematics School Sample in Norway

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Schools with advanced mathematics classes	50	2	48	0	0	0	0
Schools with advanced mathematics and physics classes and 35 or more physics students	12	0	12	0	0	0	0
Schools with advanced mathematics and physics classes and 20 to 34 physics students	14	0	14	0	0	0	0
Schools with advanced mathematics and physics classes and 10 to 19 physics students	36	0	36	0	0	0	0
Schools with advanced mathematics and physics classes and less than 10 physics students	24	0	23	0	0	1	0
<b>Total</b>	<b>136</b>	<b>2</b>	<b>133</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>

### Allocation of Physics School Sample in Norway

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Schools with advanced mathematics and physics classes and 35 or more physics students	24	0	24	0	0	0	0
Schools with advanced mathematics and physics classes and 20 to 34 physics students	32	0	31	0	0	1	0
Schools with advanced mathematics and physics classes and 10 to 19 physics students	58	0	58	0	0	0	0
Schools with advanced mathematics and physics classes and less than 10 physics students	16	0	14	0	0	2	0
<b>Total</b>	<b>130</b>	<b>0</b>	<b>127</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>



## Portugal

The sample design for Portugal differed from the standard TIMSS Advanced design. It consisted of a mix of the two primary TIMSS Advanced designs described in [Chapter 3](#). Some schools were sampled for advanced mathematics only, some for physics only, and some for both subjects.

### Coverage and Exclusions

- Coverage of the national desired target population was 100 percent
- For advanced mathematics, there was no school-level exclusions. For physics, school-level exclusions consisted of very small schools (less than 5 eligible students).
- Within-school exclusions consisted of students with intellectual disabilities and students with functional disabilities

### Sample Design

- Explicit stratification by the presence of eligible students from the two study populations based on the sample frame information (schools with only advanced mathematics students, schools with advanced mathematics and physics students), school type (private, public), and region within the public schools strata (7)
- No implicit stratification
- Schools were sampled using probability proportional to school size systematic sampling
- Some sampled schools were composed of classes of advanced mathematics students only. Other sampled schools were composed of some classes that had advanced mathematics students only and other classes that had both advanced mathematics and physics students.
- Classes within the sampled schools were split into 2 class groups where appropriate: classes with students eligible for advanced mathematics only and classes with students eligible for both subjects
- For advanced mathematics, classes were sampled from both class groups
- From the advanced mathematics only class group, one class was sampled and advanced mathematics booklets were distributed
- From the advanced mathematics and physics class group, all classes were expected to be selected. However, a problem during data collection resulted in only one class being selected per school. In each selected class, one out of every six students was randomly assigned an advanced mathematics booklet and the remaining students were assigned a physics booklet.
- During data collection, physics students were found in a number of schools assigned to the advanced mathematics only strata. Also, some schools assigned to the advanced

mathematics and physics strata did not have any physics students. Therefore, all sampled schools were considered eligible for both populations regardless of their classification to one group or the other.

- Out of the 73 schools originally sampled as advanced mathematics only schools, 14 schools ended up having physics students. Out of the 178 schools selected for advanced mathematics and physics, 25 schools ended up having only advanced mathematics students.
- For physics, adjacent advanced mathematics only strata were collapsed to create the jackknife zones and replicates

### Field Test Sample

- For the field test, a sample of 40 schools was selected for advanced mathematics and a sample of 24 schools was selected for physics. Only one subject was tested in the sampled schools and 2 classes were sampled whenever possible.

### Allocation of Advanced Mathematics School Sample in Portugal

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Private schools with advanced mathematics program - All regions	2	0	2	0	0	0	0
Public schools with advanced mathematics classes - Alentejo	18	0	15	0	0	3	0
Public schools with advanced mathematics classes - Algarve	2	0	2	0	0	0	0
Public schools with advanced mathematics classes - Centro	18	0	18	0	0	0	0
Public schools with advanced mathematics classes - Lisboa	8	0	6	0	0	2	0
Public schools with advanced mathematics classes - Norte	21	0	15	4	0	2	0
Public schools with advanced mathematics classes - R. A. Açores	2	0	0	2	0	0	0
Public schools with advanced mathematics classes - R. A. Madeira	2	0	1	1	0	0	0

**Allocation of Advanced Mathematics School Sample in Portugal (Continued)**

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Private schools with advanced mathematics classes and advanced mathematics and physics classes - All regions	10	0	10	0	0	0	0
Public schools with advanced mathematics classes and advanced mathematics and physics classes - Alentejo	13	0	11	0	0	2	0
Public schools with advanced mathematics classes and advanced mathematics and physics classes - Algarve	6	0	5	1	0	0	0
Public schools with advanced mathematics classes and advanced mathematics and physics classes - Centro	48	0	42	2	0	4	0
Public schools with advanced mathematics classes and advanced mathematics and physics classes - Lisboa	32	0	24	1	0	7	0
Public schools with advanced mathematics classes and advanced mathematics and physics classes - Norte	57	0	45	3	0	9	0
Public schools with advanced mathematics classes and advanced mathematics and physics classes - R. A. Açores	6	0	5	1	0	0	0
Public schools with advanced mathematics classes and advanced mathematics and physics classes - R. A. Madeira	6	0	5	0	0	1	0
<b>Total</b>	<b>251</b>	<b>0</b>	<b>206</b>	<b>15</b>	<b>0</b>	<b>30</b>	<b>0</b>

### Allocation of Physics School Sample in Portugal

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Private schools with advanced mathematics program - All regions	2	1	1	0	0	0	0
Public schools with advanced mathematics classes - Alentejo	18	11	5	0	0	2	0
Public schools with advanced mathematics classes - Algarve	2	1	1	0	0	0	0
Public schools with advanced mathematics classes - Centro	18	14	4	0	0	0	0
Public schools with advanced mathematics classes - Lisboa	8	6	0	0	0	2	0
Public schools with advanced mathematics classes - Norte	21	16	1	2	0	2	0
Public schools with advanced mathematics classes - R. A. Açores	2	2	0	0	0	0	0
Public schools with advanced mathematics classes - R. A. Madeira	2	2	0	0	0	0	0
Private schools with advanced mathematics classes and advanced mathematics and physics classes - All regions	10	2	8	0	0	0	0
Public schools with advanced mathematics classes and advanced mathematics and physics classes - Alentejo	13	3	8	0	0	2	0
Public schools with advanced mathematics classes and advanced mathematics and physics classes - Algarve	6	1	4	0	0	1	0

**Allocation of Physics School Sample in Portugal (Continued)**

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Public schools with advanced mathematics classes and advanced mathematics and physics classes - Centro	48	8	37	1	0	2	0
Public schools with advanced mathematics classes and advanced mathematics and physics classes - Lisboa	32	1	26	0	0	5	0
Public schools with advanced mathematics classes and advanced mathematics and physics classes - Norte	57	10	37	3	0	7	0
Public schools with advanced mathematics classes and advanced mathematics and physics classes - R. A. Açores	6	0	5	1	0	0	0
Public schools with advanced mathematics classes and advanced mathematics and physics classes - R. A. Madeira	6	0	5	0	0	1	0
<b>Total</b>	<b>251</b>	<b>78</b>	<b>142</b>	<b>7</b>	<b>0</b>	<b>24</b>	<b>0</b>

## Russian Federation

Two separate school samples were selected for advanced mathematics and physics.

For advanced mathematics, the Russian Federation assessed students from two programs: the Profile and Intensive streams. The summary below describes the samples from both programs.

Advanced Mathematics results were published separately for the students in the Intensive stream. Sampling characteristics for this group of students are described in the Russian Federation 6hr+ section on page 5.29.

### Coverage and Exclusions

- Coverage of the national desired target population was 100 percent
- School-level exclusions consisted of very small schools (less than 4 eligible students)
- Within-school exclusions consisted of students with intellectual disabilities and students with functional disabilities

### Sample Design

- In a preliminary sampling stage, a sample of 42 regions out of 83 was selected with probabilities proportional to school size. The 14 largest regions were selected with certainty.
- A school sample for advanced mathematics was selected first from the certainty regions and the sampled regions. More details on the sample design for advanced mathematics are given below.
- Following the selection of the advanced mathematics sample, a school sample for physics was selected from the same certainty and sampled regions, minimizing the overlap with the selected advanced mathematics sample using the Chowdhury overlap control method. Additional details on the sample design for physics are provided below.
- School weights were adjusted to take into account the sampling of regions
- Within the strata of certainty regions, schools were paired for variance calculation purposes. Otherwise, selected regions were paired for variance purposes.

### Additional details for advanced mathematics

- Schools from the 14 certainty regions were grouped together and were explicitly stratified by the presence of classes from the two advanced mathematics streams: schools with classes from the Intensive stream only, schools with classes from the Profile stream only, and schools with classes from both streams. They also were stratified implicitly by the 14 regions and 9 levels of urbanization.

- Each of the remaining 28 sampled regions became explicit strata and were further stratified by the presence of classes from the two advanced mathematics streams, as was the group of certainty regions
- Classes within schools were split into two class groups: Intensive advanced mathematics classes and Profile advanced mathematics classes, and one class was sampled from each group

**Additional details for physics**

- The 14 certainty regions were grouped into one large stratum and schools were stratified implicitly by region and 9 levels of urbanization
- Each of the remaining 28 sampled regions became explicit strata
- One eligible physics class was sampled from each selected school

**Field Test Sample**

- A convenience sample of 45 schools was selected for the field test. Of these, 29 schools were selected for physics only, and 16 schools were selected for advanced mathematics and physics.

**Allocation of Advanced Mathematics School Sample in Russian Federation**

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Schools with Intensive stream classes in certainty regions	54	0	54	0	0	0	0
Schools with Intensive stream classes in sampled regions	89	0	89	0	0	0	0
Schools with Profile stream classes in certainty regions	56	0	56	0	0	0	0
Schools with Profile stream classes in sampled regions	119	0	119	0	0	0	0
Schools with Intensive and Profile streams classes in certainty regions	7	0	7	0	0	0	0
Schools with Intensive and Profile streams classes in sampled regions	21	0	21	0	0	0	0
<b>Total</b>	<b>346</b>	<b>0</b>	<b>346</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

**Allocation of Physics School Sample in Russian Federation**

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Schools in certainty regions	70	0	70	0	0	0	0
Schools in sampled regions	123	0	117	6	0	0	0
<b>Total</b>	<b>193</b>	<b>0</b>	<b>187</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>



## Russian Federation 6hr+

For advanced mathematics, the Russian Federation assessed students from two programs: the Profile and Intensive streams. Results are provided separately for the students in the Intensive stream since this group corresponds to the group of students assessed in TIMSS Advanced 1995 and 2008. The following summary is for the Intensive stream, designated as Russian Federation 6hr+.

### Coverage and Exclusions

- Coverage of the national desired target population was 100 percent
- School-level exclusions consisted of very small schools (less than 4 eligible students)
- Within-school exclusions consisted of students with intellectual disabilities and students with functional disabilities

### Sample Design

- In a preliminary sampling stage, a sample of 42 regions out of 83 was selected with probabilities proportional to (school) size. The 14 largest regions were selected with certainty.
- Schools from the 14 certainty regions were grouped together and were explicitly stratified by the presence of classes from the two advanced mathematics streams: schools with classes from the Intensive stream only, schools with classes from both the Profile and Intensive streams. They also were stratified implicitly by the 14 regions and 9 levels of urbanization.
- Each of the remaining 28 sampled regions became explicit strata and were further stratified by the presence of classes from the two advanced mathematics streams
- One class sampled among the Intensive stream classes within each school
- School weights were adjusted to take into account the sampling of regions
- Within the strata of certainty regions, schools were paired for variance calculation purposes. Otherwise, selected regions were paired for variance purposes.

### Field Test Sample

- A convenience sample of 34 schools was selected for the field test. Of these, 18 schools were selected for advanced mathematics only and 16 schools were selected for advanced mathematics and physics.

**Allocation of Advanced Mathematics School Sample in Russian Federation 6hr+**

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Schools with Intensive stream classes in certainty regions	54	1	53	0	0	0	0
Schools with Intensive stream classes in sampled regions	89	11	78	0	0	0	0
Schools with Intensive and Profile streams classes in certainty regions	7	1	6	0	0	0	0
Schools with Intensive and Profile streams classes in sampled regions	21	5	16	0	0	0	0
Schools with Profile stream classes in certainty regions	6	0	6	0	0	0	0
Schools with Profile stream classes in sampled regions	4	0	4	0	0	0	0
<b>Total</b>	<b>181</b>	<b>18</b>	<b>163</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

## Slovenia

All schools in Slovenia with eligible students were selected for participation in TIMSS Advanced 2015. A total of 80 schools had eligible advanced mathematics students and 59 of these schools had eligible physics students. All eligible physics students took part in the physics assessment.

Since all 59 physics schools also were eligible for the advanced mathematics assessment, some students were selected for both assessments. The two assessments were scheduled on different days to accommodate this and a random mechanism determined which assessment was administered first in each school.

### Coverage and Exclusions

- Coverage of the national desired target population was 100 percent
- School-level exclusions consisted of Italian schools and Waldorf schools. For physics, very small schools with less than 7 physics students were also excluded.
- Within-school exclusions consisted of students with intellectual disabilities, and students with functional disabilities

### Sample Design

- All schools with eligible students were selected
- Explicit stratification by presence of students from the two study populations (advanced mathematics classes, advanced mathematics classes and physics classes) and the expected number of mathematics “experts” in the final year of secondary school (few, some, many). Mathematics experts were defined as students enrolled in the intensive mathematics classes, and the number of expected experts in each school was estimated based on data from the prior academic year. Schools with “many experts” were expected to have 35 percent or more of the students in the intensive classes; schools with “some experts” were expected to have between 20 and 35 percent of the students in these classes; and schools with “few experts” were those expected to have less than 20 percent of the students in these classes.
- No implicit stratification
- For advanced mathematics, eligible advanced mathematics classes were grouped by type (regular or intense mathematics classes) and one or two eligible classes from each group were sampled
- For physics, all eligible physics classes were sampled
- In strata where at least ninety percent of all schools participated, variance estimation strata and replicates were calculated in one of two ways: (1) when all classes were selected within schools, classes were used as variance strata and half-classes as replicates or (2) when classes were sampled within schools, schools were used as variance strata and classes as replicates. In all other strata, schools were paired within explicit strata for variance calculation purposes.

### Field Test Sample

- A sample of 29 schools with advanced mathematics and physics classes was selected and used for both populations. Schools participating in the field test also were part of the data collection sample.

### Allocation of Advanced Mathematics School Sample in Slovenia

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Schools with advanced mathematics classes	18	0	17	0	0	1	3
Schools with advanced mathematics classes and physics classes, with few mathematics experts	20	0	17	0	0	3	0
Schools with advanced mathematics classes and physics classes, with some mathematics experts	18	0	16	0	0	2	0
Schools with advanced mathematics classes and physics classes, with many mathematics experts	21	0	19	0	0	2	0
<b>Total</b>	<b>77</b>	<b>0</b>	<b>69</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>3</b>

### Allocation of Physics School Sample in Slovenia

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Schools with advanced mathematics classes and physics classes, with few mathematics experts	20	0	15	0	0	5	0
Schools with advanced mathematics classes and physics classes, with some mathematics experts	18	0	16	0	0	2	0
Schools with advanced mathematics classes and physics classes, with many mathematics experts	21	0	19	0	0	2	0
<b>Total</b>	<b>59</b>	<b>0</b>	<b>50</b>	<b>0</b>	<b>0</b>	<b>9</b>	<b>0</b>

## Sweden

Two separate school samples were selected for advanced mathematics and physics.

### Coverage and Exclusions

- Coverage of the national desired target population was 100 percent
- School-level exclusions consisted of very small schools (less than 7 eligible students)
- Within-school exclusions consisted of students with intellectual disabilities and students with functional disabilities

### Sample Design

- Eligible schools were initially ordered by the presence of programs offered (natural science, technological, both), by school funding (public, private), and by size. Schools were then split into two homogeneous partitions, each partition being representative of both target populations. The advanced mathematics sample was selected from one partition while the physics sample was selected from the other partition, resulting in two separate school samples for advanced mathematics and physics.
- Explicit stratification by the programs offered in school (natural science, technological, both) and by size (small, medium, large), in both the advanced mathematics partition and physics partition
- Implicit stratification by school type (public, private) in both partitions
- From each partition, a sample of schools was selected with equal probabilities, minimizing the overlap with the field test sample using the Chowdhury overlap control method
- For advanced mathematics, classes within the sampled schools were grouped by program and one or two eligible advanced mathematics classes were sampled from each program
- For physics, classes within the sampled schools were grouped by program and one or two eligible physics classes were sampled from each program

### Field Test Sample

- A sample of 48 schools was selected for both populations

**Allocation of Advanced Mathematics School Sample in Sweden**

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Larger schools with natural science and technical programs	28	0	28	0	0	0	0
Medium-size schools with natural science and technical programs	21	0	21	0	0	0	0
Smaller schools with natural science and technical programs	6	0	6	0	0	0	0
Larger schools with natural science program	30	1	28	0	0	1	0
Medium-size schools with natural science program	23	0	22	0	0	1	0
Smaller schools with natural science program	12	0	12	0	0	0	0
Larger schools with technical program	4	0	4	0	0	0	0
Medium-size schools with technical program	11	0	11	0	0	0	0
Smaller schools with technical program	8	1	7	0	0	0	0
<b>Total</b>	<b>143</b>	<b>2</b>	<b>139</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>

**Allocation of Physics School Sample in Sweden**

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Larger schools with natural science and technical programs	20	0	20	0	0	0	0
Medium-size schools with natural science and technical programs	21	0	21	0	0	0	0
Smaller schools with natural science and technical programs	10	0	10	0	0	0	0
Larger schools with natural science program	31	0	31	0	0	0	0
Medium-size schools with natural science program	16	0	15	1	0	0	0
Smaller schools with natural science program	14	0	13	0	0	1	0
Larger schools with technical program	7	0	7	0	0	0	0
Medium-size schools with technical program	6	0	6	0	0	0	0
Smaller schools with technical program	9	0	9	0	0	0	0
<b>Total</b>	<b>134</b>	<b>0</b>	<b>132</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>

## United States

A single school sample was used for both advanced mathematics and physics.

### Coverage and Exclusions

- Coverage of the national desired target population was 100 percent
- No school-level exclusions
- Within-school exclusions consisted of students with intellectual disabilities and students with functional disabilities

### Sample Design

- Explicit stratification by the presence of advanced program in school (yes, no), school type (public, private) and census region (4) within public schools
- Implicit stratification by urbanization (4) and ethnicity status (above 15% non-White students in a school, below 15% non-White students in a school)
- The structure of advanced mathematics and physics education required direct student sampling. Within sampled schools, students were assigned to one of three groups: advanced mathematics only, physics only, or advanced mathematics and physics. The advanced mathematics sample was composed of students sampled from the first and third group while the physics sample was composed of students sampled from the second and third group.
- Students selected from the advanced mathematics group were randomly assigned an advanced mathematics booklet
- Students selected from the physics group were randomly assigned a physics booklet
- Students selected from the advanced mathematics and physics group were randomly assigned an advanced mathematics booklet or a physics booklet. Consequently, about half of the students from this group received an advanced mathematics booklet and the other half received a physics booklet. During data collection, 32 advanced mathematics schools and 111 physics schools were found to be ineligible for assessment administration as they did not have eligible advanced mathematics and/or physics students.
- During data collection, 32 advanced mathematics schools and 111 physics schools were found to be ineligible for assessment administration as they did not have eligible advanced mathematics and/or physics students

### Field Test Sample

- A sample of 72 schools from 7 states was selected and used for both populations





### Allocation of Advanced Mathematics School Sample in the United States

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Private schools with no advanced program	10	8	0	0	0	2	0
Public schools with no advanced program in census regions 1 and 2	14	5	7	0	0	2	0
Public schools with no advanced program in census region 3	10	5	4	0	0	1	0
Public schools with no advanced program in census region 4	10	7	2	0	0	1	0
Private schools with an advanced program	19	0	12	1	0	6	0
Public schools with an advanced program in census region 1	49	2	28	0	0	19	0
Public schools with an advanced program in census region 2	58	1	41	5	0	11	0
Public schools with an advanced program in census region 3	104	0	88	3	0	13	0
Public schools with an advanced program in census region 4	74	4	48	2	0	20	0
<b>Total</b>	<b>348</b>	<b>32</b>	<b>230</b>	<b>11</b>	<b>0</b>	<b>75</b>	<b>0</b>

**Allocation of Physics School Sample in the United States**

Explicit Stratum	Total Sampled Schools	Ineligible Schools	Participating Schools			Refusal Schools	Excluded Schools
			Original Schools	1st Replacement	2nd Replacement		
Private schools with no advanced program	10	8	0	0	0	2	0
Public schools with no advanced program in census regions 1 and 2	14	11	2	0	0	1	0
Public schools with no advanced program in census region 3	10	8	1	0	0	1	0
Public schools with no advanced program in census region 4	10	9	0	0	0	1	0
Private schools with an advanced program	19	5	9	0	0	5	0
Public schools with an advanced program in census region 1	49	9	20	0	0	20	0
Public schools with an advanced program in census region 2	58	14	26	4	0	14	0
Public schools with an advanced program in census region 3	104	28	64	3	0	9	0
Public schools with an advanced program in census region 4	74	19	34	2	0	19	0
<b>Total</b>	<b>348</b>	<b>111</b>	<b>156</b>	<b>9</b>	<b>0</b>	<b>72</b>	<b>0</b>